

REMARKS

Entry of the foregoing amendments and favorable consideration of the subject application is respectfully requested in view of the following comments.

Claims 1 and 2 are currently pending. Claim 1 has been amended to correct the placement of Formula (1) and in response to the outstanding official action and claims 1 and 2 are herewith represented for the examiner's consideration.

With regard to claim 1, it has been noted that the formatting of the claim contains an error in the placement of formula (1) in comparison with the text. The present formatting, as shown in the publication of the subject application, locates the formula (1) between the phrases "as main components on a substrate" and "wherein said thermally sensitive recording layer". The correct location for formula (1) is after the phrase "wherein said thermally sensitive recording layer contains at least one compound represented by general formula (1)," The present amendment corrects this formatting error by deleting the formula from its present incorrect location and entering the formula at its correct location without making any change to the represented compound.

In addition, to the foregoing, claim 1 has been amended to limit the sensitizer to a compound represented by general formula (1) wherein R_1 is restricted to a halogen atom. This limitation is supported by the disclosure of the published application at

paragraph 15 on page 2, which states "[A]s a specific example of the compound represented by general formula (1) ... in particular, among these compounds, di(p-chlorobenzyl)oxalate is desirable." and by Example 1 of the specification.

Furthermore, claim 1 has been amended to restrict the stabilizer to 3-{[(phenylamino)carbonyl]amino}benzenesulfoneamide represented by formula (2). This amendment is also supported by Example 1 of the specification.

Claim 2 has been amended to specifically recite the organic color developing agent as consisting of a compound represented by general formula (4) wherein, R₂ is an alkyl group of carbon number 1-4, an alkoxy group, a phenyl group or a hydrogen atom. This limitation is fully supported by the specification as filed.

Accordingly, the composition of claim 1 requires both the sensitizer consisting of di(p-halobenzyl)oxalate and the stabilizer consisting of 3-{[(phenylamino)carbonyl]amino}-benzenesulfoneamide.

Applicants respectfully submit that no new matter has been added by the foregoing amendments and that they are properly enterable at this time.

Rejection of Claim 1 Under 35 U.S.C. 103(a)

Claim 1 has been rejected under 35 U.S.C. 103(a) as unpatentable over Kaneko, et al., U.S. Patent 6,846,619. The Official Action states:

"This patent teaches a thermally sensitive recording medium which can contain a color former, a compound of applicants' formulae (1) as a color developer and a compound of applicants' formula (2) as a sensitizer. See column 10, lines 37 and 38 and column 11, lines 55 and 56. WO 00/14058 disclosed in column 11 teaches the compound of formula (2)."

Applicants respectfully traverse the rejection because the *prima facie* case of obviousness has not been established with respect to the presently pending claim 1 as herein amended.

The Federal Circuit has ruled that a *prima facie* case of obviousness must establish: (1) some suggestion or motivation to modify the references; (2) a reasonable expectation of success; and (3) that the prior art references teach or suggest all claim limitations. Amgen, Inc. v. Chugai Pharm. Co., 18 USPQ2d 1016, 1023 (Feb. Cir. 1991); In re Fine, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988); In re Wilson, 165 USPQ 494, 496 (C.C.P.A. 1970).

A *prima facie* case of obviousness must also include a showing of the reasons why it would be obvious to modify the references to produce the present invention. See Ex parte Clapp, 277 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). The examiner bears the initial burden to provide some convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings. Id. at 974.

Applicants respectfully submit that a *prima facie* case of obviousness has not been established as there is no convincing line of reasoning which would lead one of ordinary skill in the

art to apply the teachings of Kaneko, et al., to obtain the thermally sensitive recording medium of the present invention, particularly in view of the unexpected improvements obtained by the present invention as shown by the examples and comparative examples in the present specification.

The examiner contends that Kaneko, et al., teaches a thermally sensitive recording medium which contains a compound of Applicants' formulae (1) as a color developer and a compound of Applicants' formula (2) as a sensitizer, referring to column 10, lines 37 & 38 and column 11, lines 55 & 56 of the reference.

With regard to formula (2), Applicants respectfully point out that this is a stabilizer in the present invention, not a sensitizer as characterized by the examiner. Furthermore, Applicants respectfully point out that the present amendment now specifically identifies the compound of formula (2) as 3-NC(=O)c1ccc(N)cc1S(=O)(=O)c2ccccc2 and has deleted the recitation to the ureaurethane compound represented by formula (3). Nowhere does Kaneko, et al., disclose or suggest the inclusion in the described thermosensitive recording material of a stabilizer corresponding to 3-NC(=O)c1ccc(N)cc1S(=O)(=O)c2ccccc2 or, indeed, of any sulfonamide type stabilizer.

The examiner's reference to column 10, lines 37 & 38, column 11, lines 55 & 56 and WO 00/14058 in column 11 of Kaneko, et al., as disclosing or teaching the compound of formula (2) is

incorrect. As Kaneko, et al., clearly states at column 10, lines 37 & 38, WO 00/14058 specifies a urea-urethane compound such as Applicants' formula (3), now deleted from claim 1, not the 3-[[{(phenylamino)carbonyl]amino}benzenesulfonamide of formula (2). Nor does column 11 at lines 55 & 56 of the reference disclose Applicants' formula (2). Rather, those lines reference sensitizers in the form of dibenzyl oxalate, bis(4-methylbenzyl)oxalate and bis(4-chlorobenzyl)oxalate.

In the absence of any teaching to suggest the inclusion of a stabilizer in general or 3-[[{(phenylamino)carbonyl]-amino}benzenesulfonamide of formula (2) in particular, there is no motivation from Kaneko, et al., to make the modification suggested by the examiner to obtain the present invention, nor is there any reasonable expectation of success to be obtained by such modification. Applicants therefore respectfully submit that a *prima facie* case of obviousness over the Kaneko, et al., reference has not been made and that the rejection of claim 1 as obvious over Kaneko, et al., should be withdrawn.

Rejection of Claim 2 Under 35 U.S.C. 103(a)

Claim 2 has been rejected under 35 U.S.C. 103(a) as unpatentable over Kaneko, et al., in view of either of Minami, et al., U.S. Patent 5,733,843, or Chuichi, et al., JP 2002-178646. The Official Action states:

"The primary reference applies as per the preceding paragraph. The secondary references teach that applicants' compounds of formula (4) are conventional color developers. Since it is obvious to combine separately taught ingredients which perform the same function, use of the color developer of the secondary references in conjunction with the color developer of the primary reference would have been obvious to one of ordinary skill in this art in the absence of unexpected results."

Applicants respectfully traverse the rejection because the *prima facie* case of obviousness has not been established with respect to the presently pending claim 2 as dependent from the herein amended claim 1.

As noted above with respect to claim 1, Kaneko, et al., fails to disclose or suggest the inclusion of 3-([(phenylamino)carbonyl]amino)benzenesulfonamide as a stabilizer. Inasmuch as claim 2 is dependent from claim 1, claim 2 is considered to include all of the limitations of its parent claims. Applicants respectfully point out that the reference to Chuichi, et al., like Kaneko, et al., fails to disclose or suggestion the inclusion of 3-([(phenylamino)carbonyl]amino)benzenesulfonamide as a stabilizer so as to cure the deficiency of the primary reference. Indeed, there is no disclosure or suggestion in Chuichi, et al., to such compounds represented by Applicants' formula (2) as a stabilizer in a thermally sensitive recording medium.

Furthermore, neither Kaneko, et al., nor Chuichi, et al., disclose or suggest a thermally sensitive recording medium

wherein the recording layer contains a sensitizer that is specifically limited to a di(p-halobenzyl)oxalate and a stabilizer that is specifically limited to 3-
{[(phenylamino)carbonyl]amino}benzenesulfonamide in combination with the specific color developing agent provided in claim 2.

Accordingly, Applicants respectfully submit that the combination of Kaneko, et al., and Chuichi, et al., fails to establish a *prima facie* case of obviousness because there is no motivation from Chuichi, et al., to modify Kaneko, et al., to obtain the present invention, nor is there any reasonable expectation of success to be obtained by such modification. Applicants therefore respectfully submit that a *prima facie* case of obviousness over the Kaneko, et al., reference in view of Chuichi, et al., has not been made and that this ground of rejection of claim 2 should be withdrawn.

As for the reference to Minami, et al., Applicants point out that although Minami, et al., discloses diphenyl sulfone compounds as developers in thermal sensitive recording media, the combination of this reference with Kaneko, et al., fails to provide a basis for a *prima facie* case of obviousness because the resulting composition is different from that of the presently claimed invention.

Claim 1 as amended herein provides a thermally sensitive recording medium comprising a thermally sensitive recording layer which contains the specific compound represented by formula (1)

which is limited to such compounds wherein R_1 is restricted to a halogen atom. As noted herein, this limitation is supported by the disclosure of the published application at paragraph 15 on page 2, which states "[A]s a specific example of the compound represented by general formula (1) ... in particular, among these compounds, di(p-chlorobenzyl)oxalate is desirable." and by Example 1 of the specification. Accordingly, the invention recited in claim 1 and, by dependency, claim 2 is specific to a thermally sensitive recording medium which contains a di(p-halobenzyl)oxalate, preferably di(p-chlorobenzyl)oxalate, as a sensitizer.

Referring to Minami, et al., at column 8, lines 17-25, Applicants respectfully note that this reference specifically states:

"Further in this invention, as a sensitizer, it is effective to add aliphatic amide such as amide stearate or amide palmitate, ethylene bisamide, montan wax, polyethylene wax, dibenzyl terephthalate, p-benzylbiphenyl, phenyl α -naphthylcarbonate, 1,4-diethoxynaphthalene, 1-hydroxy-2-phenylnapthoate, 1,2-di-(3-methylphenoxy)ethane, oxalic acid di(p-methylbenzyl), β -benzyloxynapthalene, 4-biphenyl-p-tolyether, o-xylylene-bis-(phenylether), 4-(m-methylphenoxyethyl)biphenyl or the like."

Nowhere does Minami, et al., disclose or suggest the inclusion of a di(p-halobenzyl)oxalate, preferably di(p-chlorobenzyl)oxalate, as a sensitizer in combination with 3-[[[(phenylamino)carbonyl]-amino]benzenesulfonamide as a stabilizer so as to obtain the specific composition of claim 1 to which the diphenyl sulfone

represented by general formula (4) may be added to obtain the composition of claim 2. At best, Minami, et al., discloses that di(p-methylbenzyl) oxalic acid may be used as a sensitizer. However, Applicants respectfully submit that this is a different compound from the di(p-halobenzyl)oxalate specified in the present claims.

Absent some teaching in Minami, et al., to suggest the utility of di(p-halobenzyl)oxalate or an equivalence thereof to the di(p-methylbenzyl) oxalic acid of Minami, et al., Applicants respectfully submit that there is no motivation to be derived from Minami, et al., to modify Kaneko, et al., to obtain the present invention, nor is there any reasonable expectation of success to be obtained by such modification. Applicants therefore respectfully submit that a *prima facie* case of obviousness over the Kaneko, et al., reference in view of Minami, et al., has not been made and that this ground of rejection of claim 2 should be withdrawn.

Rejection of Claims 1 and 2 Under 35 U.S.C. 103(a)

Claims 1 and 2 have been rejected under 35 U.S.C. 103(a) as unpatentable over Yoshihiro, et al., JP 04-164685 in view of Minami, et al. The Official Action states:

"The primary reference teaches that the image preservability of a heat sensitive recording medium containing color formers and developers can be improved by adding a compound of applicants' formula (1). The

secondary reference teaches the advantages of employing a color developer of applicants' formula (4) with a stabilizer of applicants' formula (2) in thermally sensitive recording medium. Use of compounds (10, (2) and (4) in combination for their concomitant functions in a thermally sensitive recording material would have been obvious to one of ordinary skill in this art in the absence of unexpected results."

Applicants respectfully traverse the rejection because the *prima facie* case of obviousness has not been established with respect to claim 1 or claim 2 as dependent from claim 1, both claims as amended herein.

With regard to Yoshihiro, et al., Applicants respectfully point out that the reference teaches a thermal recording medium which contains at least one compound having an epoxy group and a compound represented by general formula (I) which corresponds to a dibenzyl oxalate. However, it is not clear from the reference that the general formula (I) includes the di(p-halobenzyl)oxalate specifically recited in the presently amended claim 1 and required in the examples of the present application. Applicants respectfully submit that, absent an English translation of the relevant portion of Yoshihiro, et al., provided by the Office and clearly showing the teaching relied upon by the examiner, reliance upon this reference as supporting the present rejection is misplaced.

Furthermore, Applicants respectfully submit that Yoshihiro, et al.'s. requirement of at least one compound having an epoxy group, preferably a novolac type epoxy resin, a bisphenol A type

epoxy resin and a diphenylsulfonic acid derivative having an epoxy group, changes the resulting thermal recording medium such that it is a different composition from that of the present invention which does not require or include a compound having an epoxy group.

The inclusion of an epoxy group in such compositions adversely affects the properties of the thermal recording medium as shown in Comparative Examples 5 and 6 of the present invention where 4-benzyloxy-4-(2,3-epoxy-2-methylpropoxy)diphenylsulfone is used as the stabilizer instead of the herein claimed 3-[[(phenylamino)carbonyl]amino}benzenesulfonamide. As shown in the printing results of Tables 1 and 2, when compared with Examples 1 and 2 which correspond to the thermally sensitive recording medium as recited in amended claims 1 and 2, inclusion of the epoxy compound results in deterioration of the recording sensitivity, heat resistance, plasticizer resistance and water resistance.

With regard to the Minami, et al., reference, as noted above, although Minami, et al., discloses diphenyl sulfone compounds as developers in thermal sensitive recording media, the combination of this reference with Yoshihiro, et al., fails to provide a basis for a *prima facie* case of obviousness because the resulting composition is different from that of the presently claimed invention due to the inclusion of an epoxy compound as discussed. Modification of Yoshihiro, et al., by Minami, et al.,

as suggested by the examiner does not eliminate the requirement of Yoshihiro, et al., for the epoxy compound, the presence of which has been shown in the present application to have a deleterious effect on the desired properties of the thermally sensitive recording medium.

Furthermore, as noted previously, Minami, et al., at column 8, lines 17-25, specifically states:

"Further in this invention, as a sensitizer, it is effective to add aliphatic amide such as amide stearate or amide palmitate, ethylene bisamide, montan wax, polyethylene wax, dibenzyl terephthalate, p-benzylbiphenyl, phenyl α -naphthylcarbonate, 1,4-diethoxynaphthalene, 1-hydroxy-2-phenylnapthoate, 1,2-di-(3-methylphenoxy)ethane, oxalic acid di(p-methylbenzyl), β -benzyloxynapthalene, 4-biphenyl-p-tolyether, o-xylylene-bis-(phenylether), 4-(m-methylphenoxyethyl)biphenyl or the like."

Nowhere does Minami, et al., disclose or suggest the inclusion of a di(p-halobenzyl)oxalate, preferably di(p-chlorobenzyl)oxalate, as a sensitizer in combination with 3-([(phenylamino)carbonyl]-amino)benzenesulfonamide as a stabilizer so as to obtain the specific composition of claim 1 to which the diphenyl sulfone represented by general formula (4) may be added to obtain the composition of claim 2. At best, Minami, et al., discloses that di(p-methylbenzyl) oxalic acid may be used as a sensitizer. However, Applicants respectfully submit that this is a different compound from the di(p-halobenzyl)oxalate specified in the present claims and would, therefore, result in a different product when combined with the teaching of Yoshihiro, et al.

Absent some teaching in Minami, et al., to suggest the utility of di(p-halobenzyl)oxalate or an equivalence thereof to the di(p-methylbenzyl) oxalic acid of Minami, et al., Applicants respectfully submit that there is no motivation to be derived from Minami, et al., to modify Yoshihiro, et al., to obtain the present invention, nor is there any reasonable expectation of success to be obtained by such modification. Indeed, as discussed above with respect to Yoshihiro, et al.'s., inclusion of an epoxy compound, such a modification would not yield a product with the desired properties of the present invention. Applicants therefore respectfully submit that a *prima facie* case of obviousness over the Yoshihiro, et al., reference in view of Minami, et al., has not been made and that this ground of rejection of claims 1 and 2 should be withdrawn.

Rejection of Claims 1 and 2 Under 35 U.S.C. 103(a)

Claims 1 and 2 have been rejected under 35 U.S.C. 103(a) as unpatentable over Yoshihiro, et al., JP 04-164685 in view of Chiuchi, et al. The Official Action states:

"The primary reference teaches that the image preservability of a heat sensitive recording medium containing color formers and developers can be improved by adding a compound of applicants' formula (1). The secondary reference teaches the advantages of employing both of applicants' compounds of formulae (3) and (4) as color developers in thermally sensitive recording medium. Use of the color developer mixture of the secondary reference as the generically disclosed color developer of the primary reference would have been

obvious to one of ordinary skill in the art in the absence of unexpected results.

The patents to Nagai et al. and Fukuchi et al. are cited for their teaching of applicants' compound of formula (2) as a color developer in a thermally sensitive recording medium."

Applicants respectfully traverse the rejection because the *prima facie* case of obviousness has not been established with respect to claim 1 or claim 2 as dependent from claim 1, both claims as amended herein.

As Applicants have previously pointed out, the Yoshihiro, et al., reference teaches a thermal recording medium which contains at least one compound having an epoxy group and a compound represented by general formula (I) which corresponds to a dibenzyl oxalate. However, it is not clear from the reference that the general formula (I) includes the di(p-halobenzyl)oxalate specifically recited in the presently amended claim 1 and required in the examples of the present application. Applicants respectfully submit that, absent an English translation of the relevant portion of Yoshihiro, et al., provided by the Office and clearly showing the teaching relied upon by the examiner, reliance upon this reference as supporting the present rejection is misplaced.

However, even if, *arguendo*, the disclosure of Yoshihiro, et al., is taken as including a di(p-halobenzyl)oxalate, Applicants respectfully submit that Yoshihiro, et al.'s. requirement of at least one compound having an epoxy group, preferably a novolac

type epoxy resin, a bisphenol A type epoxy resin and a diphenylsulfonic acid derivative having an epoxy group, changes the resulting thermal recording medium such that it is a different composition from that of the present invention which does not require or include a compound having an epoxy group.

As the present application clearly discloses in the Comparative Examples discussed above, the inclusion of an epoxy group in such compositions adversely affects the properties of the thermal recording medium of the present invention such that the recording sensitivity, heat resistance, plasticizer resistance and water resistance of the thermal recording medium are deteriorated. Thus, the composition of Yoshihiro, et al., is different from that of the present invention and modification of Yoshihiro, et al., by the teaching of Chuichi, et al., will not change the requirement in the primary reference of the epoxy group compound.

Furthermore, Applicants respectfully point out that the reference to Chuichi, et al., fails to disclose or suggest the inclusion of 3-([(phenylamino)carbonyl]amino)benzenesulfonamide as a stabilizer. Applicants respectfully point out that the Chuichi, et al.'s., disclosure of a compound of formula (3) is moot inasmuch as that requirement has been deleted from the present claims. Indeed, without disclosure or suggestion in Chuichi, et al., as to the use of such compounds represented by Applicants' formula (2) as a stabilizer in a thermally sensitive

recording medium, modification of Yoshihiro, et al., as suggested by the examiner would not yield the thermally sensitive recording medium of the present invention even if Yoshihiro, et al., is accepted as teaching the specific di(p-halobenzyl)oxalate of the present invention.

Furthermore, neither Yoshihiro, et al., nor Chuichi, et al., disclose or suggest a thermally sensitive recording medium wherein the recording layer contains a sensitizer that is specifically limited to a di(p-halobenzyl)oxalate and a stabilizer that is specifically limited to 3-[[(phenylamino)-carbonylamino]benzenesulfonamide in combination with the specific color developing agent provided in claim 2.

Accordingly, Applicants respectfully submit that the combination of Yoshihiro, et al., and Chuichi, et al., fails to establish a *prima facie* case of obviousness because there is no motivation from Chuichi, et al., to modify Yoshihiro, et al., to obtain the present invention, nor is there any reasonable expectation of success to be obtained by such modification. Indeed, even if Yoshihiro, et al., were modified by the teaching of Chuichi, et al., the resulting composition would include the previously discussed epoxy compound of Yoshihiro, et al., with the resulting deterioration of the properties of the thermally sensitive recording medium as pointed out in the Comparative Examples of the present application. Applicants therefore respectfully submit that a *prima facie* case of obviousness over

the Yoshihiro, et al., reference in view of Chuichi, et al., has not been made and that this ground of rejection of claims 1 and 2 should be withdrawn.

As for the references to Nagai, et al., and Fukuchi, et al., Applicants respectfully submit that their combination with Yoshihiro, et al., fails to resolve the difficulty with respect to Yoshihiro, et al.'s., inclusion of the epoxy compound. Neither secondary reference suggests substituting the aminobenzenesulfonamide stabilizer for the epoxy compound of Yoshihiro, et al., accordingly, modifying Yoshihiro, et al., according to the teachings of Nagai, et al., or Fukuchi, et al., would have the effect of adding the aminobenzenesulfonamide to the epoxy compound containing composition of Yoshihiro, et al., with the retention of the deleterious effect of the epoxy compound on the properties of the resulting thermally sensitive recording medium.

Accordingly, for the reasons given with respect to the rejections over Yoshihiro, et al., in view of either Minami, et al., or Chuichi, et al., Applicants respectfully submit that a *prima facie* case of obviousness over the Yoshihiro, et al., reference in view of Nagai, et al., or Fukuchi, et al., has not been made and that this ground of rejection of claims 1 and 2 should be withdrawn.

Conclusion

In conclusion, Applicants note that the object of the present invention is to provide a thermally sensitive recording medium having excellent recording sensitivity and heat resistance of the ground color and which is excellent in recorded image preservation and stability against plasticizer, water or hot water. This is accomplished by a thermally sensitive recording medium wherein the thermally sensitive recording layer contains a sensitizer consisting of a di(p-halobenzyl)oxalate, preferably di(p-chlorobenzyl)oxalate and a stabilizer consisting of 3-[[(phenylamino)carbonyl]amino]benzenesulfonamide. This specific combination of sensitizer and stabilizer produces unexpected improvement in the properties of the thermally sensitive recording medium which is not exhibited by using the sensitizer or the stabilizer alone as shown by the results of Comparative Example 1, in which only the recited stabilizer is present, and Comparative Example 2, in which only the recited sensitizer is used, in comparison with Examples 1 and 2 in which the combination of the specified sensitizer and stabilizer is used. These results are clearly shown in the Tables of the present application where, in the case of Comparative Example 1, water resistance of the medium is insufficient and hot water resistance and plasticizer resistance of the image are bad. In Comparative Example 2, hot water resistance of the recorded image and ground color are bad as is the plasticizer resistance.

Where the recited stabilizer is used with commonly known sensitizers other than the recited di(p-halobenzyl)oxalate, as in Comparative Examples 3 and 4, the resulting properties of water resistance and hot water resistance of the recorded image and hot water resistance of the ground color are bad when compared to the present invention. Similarly, when a different stabilizer is used with the recited sensitizer, as in Comparative Examples 5 and 6, where 4-benzyloxy-4-(2,3-epoxy-2-methylpropoxy)diphenylsulfone is used as the stabilizer with the sensitizer of the present invention, there is a deterioration in the properties of water resistance and hot water resistance as discussed previously.

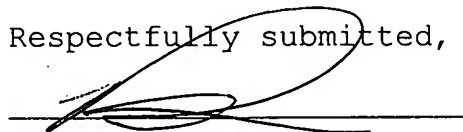
It is therefore clear from the comparison of the Examples 1 and 2 with Comparative Examples 1-6, as summarized in Table 3 of the present invention, that there is an unexpected synergistic effect when the stabilizer 3-[[(phenylamino)carbonyl]amino]-benzenesulfonamide is combined with the sensitizer di(p-halobenzyl)oxalate in a thermally sensitive recording medium and that this synergistic effect is neither disclosed nor suggested by the prior art.

Accordingly, Applicants respectfully submit that the amendments to the claims presented herein reciting a thermally sensitive recording medium containing a sensitizer and a stabilizer where the sensitizer consists of a di(p-halobenzyl)oxalate of formula (1) and the stabilizer consists of

3-{[(phenylamino)carbonyl]amino}benzenesulfonamide of formula (2) is not obvious over the prior art of record and withdrawal of the present rejections is respectfully requested.

An early notice of allowance is respectfully requested.

Respectfully submitted,



Attorney for Applicant
Robert L. Haines
Reg. No. 35,533

SHERMAN & ASSOCIATES
415 N. Alfred Street
Alexandria, VA 22314
(703) 549-2282